

**ABSTRACT OF THE DISCLOSURE**

A photocatalytic coating oxidizes volatile organic compounds that adsorb onto the coating into water, carbon dioxide, and other substances. When photons of the ultraviolet light are absorbed by the coating, reactive hydroxyl radicals are formed. When a contaminant is adsorbed onto the coating, the hydroxyl radical oxidizes the contaminant to produce water, carbon dioxide, and other substances. A humidity sensor or a temperature sensor detects the humidity or temperature, respectively, of the air entering the air purification system. Information about the optimal microwave wavelength and intensity for various humidity and temperature levels are stored in a control of a microwave actuator. The microwave actuator determines the optimal wavelength or intensity based on the sensed humidity and temperature level and sends a signal to a magnetron to emit a microwave of the desired wavelength or intensity. The microwaves are only absorbed by the water, desorbing the water from the photocatalytic coating and creating additional photooxidation sites for the contaminants.

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